

## PC/C Boundary; What happened on the Earth, inferred from geology in South China

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[Problem]The Precambrian/Cambrian boundary is one of the most critical times for the evolution of life, i.e., from small bacteria to large multi-cellular animals, presumably under the condition of rapidly increased oxygenic environment after the latest Proterozoic snowball Earth. To monitor the environmental change at this transition period, chemo-stratigraphic approach has contributed significantly to understanding the bio-environmental change, particularly to elucidate the critical boundary horizon. Combining this with geochronology, geology, Sr isotopic changes, and paleontological observations, we infer the story on the PC/C boundary as below.

[Definition of PC/C boundary and Biological Evolution ]

Our result of  $\delta^{13}\text{C}_{\text{carb}}$  of drilled cores from S. China clearly demonstrates that the world-largest excursion of  $\delta^{13}\text{C}_{\text{carb}}$  from +4 to -9 occurred twice near the PC/C boundary, suggesting the extreme environmental change, presumably super-anoxic events. The timing of these two super-anoxic events must be younger than 542Ma, and older than 530Ma. This signal of gradual change of environment suggest a mass extinction analogous to the P/T boundary. Hence a suggested scenario gives a different definition of Ediacaran/Cambrian boundary from the previous one. The boundary may be defined by the assemblage of small shelly fossils in future.

The Ediacaran begins right after the Marinoan deglaciation at 635Ma, and ends sometime around 535Ma. The Ediacaran period is the transient time of sedimentation from alternating sandstone and mudstone to limestone in a shallow marine environment, presumably by biological processes. The Doushantuo F and Dengying F. in S. China correspond to the early and late Ediacaran time, and abundant and diversified fossils are present including first animals from Weng'an Biota.

[Environmental change and its cause]

For the extreme chemical change of seawater may be related to the snowball Earth, right before the Marinoan glaciation at 635Ma. The extensive erosion of continental crust, bringing Ca, Na, K, V and other critical elements into the ocean, as well as increased oxygen by photosynthesis, enabled the Ediacaran animals to appear. The major cause to initiate the snowball Earth may be controlled by the extremely depressed Core dynamo in this period.